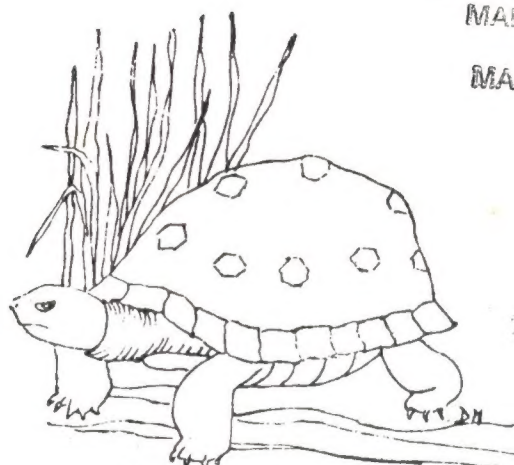


6: NO. 21

HAMADRYAD



BUFO MELANOSTICTUS



GEOCHELEONE ELEGANS

CENTRE FOR HERPETOLOGY
MADRAS CROCODILE BANK
POST BAG No. 4
MAMALLAPURAM 600 104
T.N., S. INDIA

News from the MADRAS SNAKE PARK and
MADRAS CROCODILE BANK

The female C. palustris at MSP laid a clutch of just three eggs on the morning (7 a.m) of 12 March. It was thought that she had been disturbed, and would resume her maternal duties at a later date but no further activity was noticed.

The 2½ ft. female green iguana (Iguana iguana iguana) from Sri Lanka Zoo laid a clutch of 40-50 eggs on 21 March. This is her second clutch at the Snake Park. The first nest of 41 eggs was laid on March 17 1980; 27 hatched on 26 May after a 71 day incubation; of these 20 survive and are about a foot long.

A trinket snake Elaphe helena laid 8 eggs in February. Of these 7 hatched on 25 March and are being reared on geckos.

A male and female rock python (Python molurus) were loaned to the Snake Park by the zoology department of Madras Christian College. Mating was observed immediately after being released into their enclosure. Bob Larson suggests that as is often the case the bumpy ride perhaps stimulated the pair. The gravid female has been isolated and the male paired with one of our original females.

Visitors to MSP and MCB included Dr Konrad Klemmer, Curator of Herpetology, Senckenberg Museum, Dr Russell Mittermeier of World Wildlife Fund, USA and Don Ashley, President of the Florida Alligator Association, Valadislov Jirousek, Director of the Zoological Park in Prague and Peter Pavlik an amphibbiologist spent some time with us on their way to Sri Lanka.

Bob Larson, a herpetologist from Utah, USA who has worked at the Snake Park for a year and a half will leave shortly to return to the United States. During the director's absence in Papua New Guinea Bob worked extensively on specialized housing, maintenance and health problems; this resulted in modified cage designs and routine husbandry programmes. His manual for the use of keepers at MSP is comprehensive and practical. We wish him all good luck.

(1)
CENTRE FOR HERPETOLOGY
MADRAS CROCODILE BANK
POST BAG NO. 2
MARALAI
T.N. 605 007

Editor's Note

Kartikaya Sarabhai of the Community Science Center, Ahmedabad, visited the Park at 6 a.m. one day and we held a bleary eyed discussion about the need for an Indian herp symposium. Some very good herp work is now being done all over the country and a mass congregation of herp people is long overdue. Tentatively the symposium is being planned for March/April next year but this date is (very) subject to change. The Snake Park and the Science Center will be asking for original papers and at least one day will be set aside for discussing conservation policies, skin trade and so on. The venue may be Ahmedabad, Gujarat. Ideally of course the CSC will do all the organizing and spadework, while the Park shares the credit.

Subscribers have probably discovered by now that non-payment of the Hamadryad subscription doesn't stop our damper newsletter from blackening your desk. In fact we are too kind hearted to strike people off our list. So you might as well give in and send your cheque.

Turtle Sanctuary

The Calicut branch of the Kerala Natural History Society has suggested to the Kerala Wildlife Department that the coastal stretch between Ponnani and Tellicherry be constituted a sanctuary for sea turtles. Supportive letters should be written to the Chief Conservator of Forests, Wildlife Department, Trivandrum, Kerala.

Report on IUCN/SSC and CITES Meeting

(Submitted to the Trustees, MSPT)

I attended the two meetings in New Delhi between February 17th and March 5th. In addition I travelled to Dehra Dun and stayed as a guest of the Forest Research Institute with Zafar Futehally. While there, I was invited to give slide lectures at the Dun School, Welham Girls School and to the F.R.I. cadets. It was gratifying to see the interest of the students and cadets in the work we are doing.

The Species Survival Commission meeting was held at Vigyan Bhavan and was attended by members of most IUCN Specialist Groups. Sir Peter Scott was present and the meeting was presided over by Richard Fitter and Grenfell Lucas. During the one week meeting, matters concerning wildlife conservation were tabled, discussed and resolutions passed. As a Crocodile Specialist Group member for India, I reported on the current status of crocodiles in the country and also described the advances made in the Papua New Guinea programme. Several colleagues and myself suggested the formation of a Snake Specialist Group and it is likely that this proposal will be ratified at the next meeting in June. Dr. El Moll requested me to serve as regional co-ordinator of the Freshwater Turtle Group and mentioned the availability of grants of about US\$-2000 for turtle survey work. The draft report on the reptile skin industry in India was shown to me for comments and will soon be in print. The SSC meeting was mainly concerned with updating of a very wide range of subjects covering most nations. It was a preamble to the forthcoming IUCN General Assembly in October.

The CITES (Convention on International Trade in Endangered Species) meeting focussed on the trade in wildlife. Most member nations of the treaty were present and as can be imagined the discussions among government representatives, conservation groups and animal trade representatives were lively. Concerning reptiles, the most important agreements reached were that farming of reptiles for commercial trade will be permissible if there is no drain on wild populations; the ranching of reptiles such as turtles and crocodiles (i.e. rearing wild caught young or collected eggs) would be examined further by a special committee. The general attitude was that programmes such as the crocodile management programmes in Papua New Guinea, Zimbabwe, USA (alligator) and (in future) India are the best ways of ensuring that the governments and people in developing countries sustain an interest in preserving species like crocodiles and the habitat they live in. Though CITES cannot hope to completely control the trade in endangered species it is doing an excellent job in getting the conservation groups, the trade groups and the government representatives together to formulate official trade procedures. Some of the issues are very delicate, with considerable political importance. For example, the USA wants a steady supply of monkeys for medical testing but many countries (including India) are bowing to conservation pressure and banning or severely restricting trade in monkeys. The problem of what to do with confiscated goods also raised heated debate; should rhino horn, ivory etc. be destroyed after seizure by customs?

In general the meetings were highly educational, the most important part perhaps being the opportunity to meet and discuss with experts in the field from all over the world.

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The Crocodile Rearing Project at Sathanur

In late March I visited the government crocodile programme at the Sathanur Dam. The mugger (*C. palustris*) population here is estimated at 30-35, with 13-15 nesting females. Annual egg collection and captive rearing has been conducted since 1977 with initially some assistance from the Snake Park. During the breeding season Irula tribals are hired at the ten sq. mile site to locate nests and transport eggs to the hatchery in the locally used buffalo hide coracles.

In these years (since '77) some 1541 eggs have been collected resulting in 620 hatchlings of which 536 survive. Hatchlings have been supplied to other crocodile projects in Andhra Pradesh, Orissa and Tamil Nadu.

According to Ponnumudi, one of the Irula trackers employed by the programme, the largest clutch size has been 39 eggs, in 1980. (clutches of over 40 eggs have been reported from Vakkaramari Waterworks in Chitambaram).

Some three years ago two mugger were shot by poachers in Sathanur. There has been no recent hunting.

I was fortunate during this trip in being able to participate in three nest collection and transfer sessions. On 21 March while patrolling the banks in light coracles we located a nest which had been laid on the 19th night. It was 3 m from the water and 1 m above the water line. There were a total of 29 eggs; these were transferred to the hatchery in wooden crates, packed in nest material (earth). Faeces examined contained a high percentage of feathers and wildlife personnel confirmed that birds form a large part of these crocodile's diet.

Nest II was sighted and collected on 24th March upriver from the dam area on the South Pennar River. Arriving by motor boat the nest was excavated and transferred at 6.45 a.m. Around the nest were three trial nest holes. The egg total was 29. The nest was $4\frac{1}{2}$ m from the water and height above water level was $\frac{1}{2}$ m.

Distance between trial nests A, B, C was $16\frac{1}{2}$ m and $1\frac{1}{2}$ m. Distance between trial nest C and the eggs was $\frac{1}{2}$ m.

Nest III was laid on the 22nd night 7 kms upriver from the dam. Number of eggs was 33. The nest was $6\frac{1}{2}$ m from the water and 67 cms above water level.

An interesting sidelight of this trip was learning about the local tribals' technique of distinguishing a crocodile's sex by its foot print. Irulas believe that the female's foot print is thinner and that of the male is more splayed out due to weight distribution.

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Holy Turtles

Hopefully the people who subscribe to Hamadryad are not all members of the Bombay Natural History Society. If so it creates an editorial problem for us because we are in the habit of regularly lifting material from Hornbill. So far we have got away with it. Religious feeling, more than legal protection, has come to the rescue of some reptile species on the subcontinent. The mugger of Mugger Pir near Karachi have enjoyed the veneration and protection of local people for many generations. In parts of southern India it is considered auspicious that a cobra enter your garden, and hasty religious rites are performed after the snake is safely out of the way. And in Tripura we visited and were unable to identify a group of softshell turtles being spoiled rotten in a temple tank near Agartala.

The most dramatic of these reptile rituals of course is the snake festival of Battis Shirala in Maharashtra. For that one week in the year, ordinary farmers lay down their tools and become snake catchers. They go out into the fields and catch cobras, monitor lizards and other species of snakes. Cobras are not defanged, and after a week of worship and festivity the reptiles are released.

In the 1980 (4) Hornbill, then, Ml. Ali Reza Khan has written about the religious respect enjoyed by Trionyx nigricans in the Byazid Bostami shrine in Bangladesh. The Bostami turtle (as Dr. Khan suggests it be called) apparently does not occur elsewhere and enjoys strict protection at the shrine. Their main source of food is the fish and meat that visitors are able to buy at the temple, skewered pieces of which are hand fed to the turtles.

Dr. Khan estimates the turtle population at 150-200.

Three more reptile centres

There seems to be a boom in reptile shows/parks/centres/ associations in the country. A healthy sign. There is now a Reptile Research Association at 6, Kashinath Kripa, M.G. Road, Naupala, Thane 400 602, Maharashtra. We look forward to further information from the Honorary Secretary about what sort of work the association is going to be involved with.

The Snake Park's association with Kartikeya Sarabhai of the Community Science Centre in Ahmedabad has been a very happy one, beginning with our snake exhibition there in 1976 in conjunction with World Wildlife Fund. During that trip the MSP director casually threw out an arm and said Why not have a snake park here? This park is now apparently very successful. The manager is Albert Rajendran, the son of Dr M V Rajendran who is one of our Trustees.

The third recently developed snake 'facility' is the Parassinikkalavu Snake Park in Kerala. It is not yet open to public visitation but will be soon. The manager is Robin Miller also an MSP Trustees' son.

Telemetric studies on Gavialis

Mel Sunquist of the Smithsonian Institution was in Madras recently. He has been involved with telemetry studies for many years, and in February this year lead a project to catch and attach radio collars to 50 Gavialis in the Royal Chitawan National Park in Nepal. His Nepali counterparts within the National Parks Board will monitor these animals.

Snakebite

We continue to receive urgent communications asking for advice on snakebite treatment, often when it is too late. Last month there was a postcard from Andhra Pradesh about a 16 year old boy who was severely bitten by a Russell's viper. He was rushed to hospital but taken home when it became obvious that the boys leg might have to be amputated. Since then he has been 'treated' with local herbal preparations. But amputation may be necessary to save his life.

Anamallai who was once employed at MSP was bitten by a cobra on his left hand (index finger) in middle March. He was bitten at 6.30 a.m. but refused to be taken to hospital and was finally brought to the Snake Park at 10.30 a.m. By this time there was considerable swelling and pain and ptosis was already setting in. We rushed him to Royahpettah Hospital and he received his first vial of antivenom (10 cc) at 11 a.m. Another (10 cc) was later administered intravenously and he was retained by the hospital in spite of much resistance.

Subsequently Anamallai escaped from hospital. He reappeared at the Snake Park on 9 April with a very gangrenous looking hand. He was taken to hospital but refused to stay and the doctors were unable to retain him against his will and that of his family's. Another attempt was made to get him admitted the next day but he and his family insisted on being taken home. Dr B Mardikar who has a long and generous association with the park came to the rescue once again and is treating Anamallai at home.

Robin Miller was bitten by a cobra on 13th April and taken to a private nursing home in Madras. Although there were no symptoms of envenomation 1½ hours after the bite his finger was incised and 400 cc's of venous blood was drained.

In the "Times of India" of 19 March there was a note about a new approach to treatment of snakebite. It said antivenom serum is effective if administered before the poison has already produced serious effects. But most victims live in rural areas where adequate medical facilities are not available. At Hanidia Hospital in Bhopal a team led by Dr N P Mishra, head of the department of medicine has been experimenting with a new line of treatment which doctors claim has cured all snake-bite victims brought to the hospital with symptoms of poisoning. Besides "symptomatic treatment" those bitten by cobras were administered neostigmine a drug used to treat 'myasthenia gravis' while those affected by viper poison were treated with heparin which checks blood coagulation. Preliminary studies indicate that mortality from snakebite can be reduced considerably by this new approach.

The Mawanelle Snakebite Treatment Hospital, Polambegoda, Ussapitiya, Sri Lanka was opened recently. The Chief Medical Officer would appreciate reprints and information on snakebite treatment from other countries.

Venomous or Not?

Two Asian snakes closely related to several common Indian keelbacks and watersnakes have in recent years been found to be dangerously venomous.

The Red-necked keelback (Rhabdophis subminiatus) is distributed throughout much of Asia. It is found in Sikkim and other parts of the eastern Himalayas. Together with another Asian natricine snake (Rhabdophis nigrocinctus) the large posterior pair of maxillary teeth are grooved as in typical back-ranged species such as the boomslang of Africa and snakes of the genus Boiga. While it was previously thought to be non-venomous and treated as such "it is now known that the Red-necked Keelback is capable of inflicting life-endangering bites. When biting, it attempts to chew on its victim, and in this way may eventually inflict a deep and prolonged bite with the use of two greatly-enlarged solid teeth on each side at the back of the upper jaw. Its venom, which is believed to originate in the Duvernoy's glands, is dangerously toxic. (Romer, 1979).

Rhabdophis tigrinus (yamakagashi) is a common keelback in Japan and generally considered non-venomous. In 1973 a 13 year old boy was bitten on the hand and for several days suffered pain, swelling and severe ecchymosis (bleeding under the skin). The patient improved after a week when blood transfusions were given (Kono and Sawai, 1975).

While none of the other Indian Rhabdophis and closely related genera have been found to be venomous, the Saliva of these taxa should certainly be tested for toxicity.

- References: 1) Romer, J.D., The Red-necked Keelback, a venomous snake of Hong Kong, Urban Council, Hong Kong 1979.
- 2) Kono, H and Y Sawai, Systemic poisoning from the bite of Rhabdophis tigrinus, The Snake, Vol.7, pp.38-39, 1975.

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Sex ratios in clutches of captive bred mugger (Crocodylus palustris)

Almost nothing has been written about the sex ratio of individual clutches of C. palustris. There is a similar dearth of information on other species. One important reason is of course that it takes 2-3 years for a majority of the animals to reach a size where manual probing to determine sex is possible.

Table 1 shows the sex ratios of seven individual nests at MSPT and MCBT in 1978 and the collective ratio of 5 nests in 1977.

Table 1: Sex ratio of mugger clutches

<u>Year</u>	<u>Nest</u>	<u>Number of</u>	<u>Number in</u>	<u>Number</u>	<u>Number</u>	<u>Number</u>
	<u>Number</u>	<u>hatchlings</u>	<u>April 1981</u>	<u>males(%)</u>	<u>females(%)</u>	<u>unknown(%)</u>
1977	1-5	59	49	36(73.5)	13(26.5)	-
1978	1	21	11	2	9	-
	2	8	5	-	4	1
	3	29	22	-	20	2
	4	9	9	-	7	2
	5	3	1	-	1	-
	6	19	10	7	3	-
	7	17	12	-	12	-
1978	Totals	106	70	9(13.8)	56(86.2)	

Recent literature has substantiated that temperature is a critical sex determinant during the incubation stage of a number of sea turtles and freshwater turtles. Temperatures of an average of 1-2°C lower than the natural nest temperature average may produce over 80% males. Ted Joanen (pers comm.) says that his preliminary findings indicate that high temperatures during incubation result in a higher % of males. The result at the Madras Snake Park and Madras Crocodile Bank (73.5% males in 1977 and 86.2% females in 1978) point to a potent determining factor such as temperature. Nest temperatures for nests 1-5 were individually recorded and averages are given in Table 2. Data for nest No.6 which produced mostly males are unfortunately lacking.

Table 2 1978 nest temperatures* (°C)

<u>I. Month</u>	<u>Nest</u>	<u>Max. X temperature</u>	<u>Min. X temperature</u>
	<u>number</u>		
Feb.	(2)	30.78	29.23
Mar.	(4)	31.89	29.78
April	(5)	30.25	28.90
May	(2)	31.44	29.78

II. Feb - May (5 nests, 4 month aggregate)

	<u>Range</u>	<u>Average</u>
Minimum	28.07 - 30.26	29.36
Maximum	29.60 - 33.77	31.02

* Nest temperatures are taken thrice daily (0800,1200,1800) by inserting a thermometer into a PVC tube buried in the egg chamber.

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A Mega-farm for Crocodiles, with an observation on maximum reproductive ages

A quiet, dignified man named Uthai Youngprapakorn started what is now the giant Samut Prakan Crocodile Farm back in the 40's with a breeding stock of a few pairs and \$250. Now the sprawling farm encompasses 600 acres; your visual impression is correct: acres and acres of crocodiles.

You talk to any of the oldtimers, to them its common knowledge that the only successful croc (or gator) farmer is the man who is fascinated by them, appreciates and understands their psychology. Uthai and his son Charoon fit the description and now operate a farm which breaks several records.

1. Largest population on any farm (over 30,000)
2. Greatest egg production of any farm (over 5000 per year)
3. Largest skin output of any farm (over 2000 per year)

Very roughly, the farm consists of six large (several acre) breeding enclosures with concrete lined ponds and separate nesting "cubicles" for each female. One enclosure contains pure C. porosus (saltwater crocodile) stock, one contains pure C. siamensis (Siamese crocodile) stock and 4 contain mixed stock (male C. porosus and female C. siamensis) which are producing a hybrid preferred by the Yangprapakorns for skin quality and rapid growth rate. The hybrids are said to now be breeding as well. The original breeders are 40-60 years old and most of these females do not lay eggs anymore though the males continue to be sexually active with younger females. Over 80% of the stock is C. siamensis, a fairly amiable crocodile. C. porosus is a notably territorial beast which causes obvious problems in a captive breeding situation. Many of the C. porosus are scarred and perhaps only 50% of the females nest. Samut Prakan has 1:3 Tomistoma schlegelii (Malayan gharial). The three females have been laying 30-40 eggs each during March for past 5 years. At present there are about 120 1.5 m long juveniles, though no very young ones were seen. The skin of the Malayan gharial is said to be commercially useless because of the osteoderms (bone plates) in the belly scales.

The rearing enclosures seem crowded but the animals are obviously healthy and growing. Below is the rough stocking rate per pen.

<u>Pen size (metres)</u>	<u>Number of crocodiles</u>	<u>Age group</u>
1.5 x 1.5	20	yearling
3 x 3	20-30	1-2 years
15 x 15	50-70	2-4 years
15 x 20	70-100	3-5 years

Feed for the crocodiles is trash fish and chicken abattoir waste, both very cheaply available. The farm makes a good income from the two million annual visitors and completely utilizes the 2 to 3000 crocodiles culled each year. Skins are exported mainly to Japan; meat is marketed locally; feet and head are mounted for souvenirs; penises, gall bladders, fat, intestines and scent glands are sold to Chinese medicine manufacturers.

Samut Prakan could play a vital role in helping- re-introduce Thailand's three species of crocodiles, which are reportedly extinct there, or very close to it. It is particularly urgent that a reserve for C.siamensis be set up and that the Yangprapakorn's be approached for pure stock to re-establish the species in the wild.

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Man killings by snakes from "Travellers India." Edited by H K Kaul

Oxford, 1979 -- (excerpt by Mark Twain from Vol.14 of the "Complete Works of Mark Twain", Hayeeer, N Y 1925, pp.223

"In India, the annual man-killings by snakes are as uniform, as regular, and as forecastable as are the tiger average and the suicide average. Anyone who bets that in India, in any three consecutive years, the snakes will kill 49,500 persons, will win his bet; and anyone who bets that in India in any three consecutive years the snakes will kill 53,500 persons, will lose his bet. In India the snakes kill 17,000 people a year; they hardly ever fall short of it; they as seldom exceed it. An insurance actuary could take the Indian census tables and the government's snake tables and tell you within sixpence how much it would be worth to insure a man against death of snake-bite there. If I had a dollar for every person killed per year in India, I would rather have it than any other property, as it is the only property in the world not subject to shrinkage (1896).

Snake Swallows Man!

How quickly the newspapers pick up and internationally circulate a garbled story, generally from an Indonesian hinterland that a man (or sometimes even two or three!) had recently been swallowed by a python. The ananconda; reticulated, Indian rock and African rock pythons are all boid snakes which grow large enough to overpower and swallow at least a subadult human but we are apt to pass off these newspaper reports as nonsense.

Two recent articles, one a scientific note and the other a magazine item describe two fatal attacks by pythons. On page 11 of the Hong Kong magazine "Asia Week" of 28 Sept. 1979 there is a brief description of the death and engulfment by a reticulated python of farmer Ajobuka from a village in Central Sulawesi, Indonesia. He was walking home and was attacked close to his house, apparently after dark. Neighbours heard his screams but the snake, said to be 6 metres long was not found till after it had swallowed the man. The article is accompanied by a fairly clear photo of a large reticulated python cut open at the mid section with the legs of a shorts and shirt clad human protruding.

The second account describes several newspaper stories on python attacks in different parts of Africa but specifically a case which occurred in northern Transvaal in November, 1979. A 13 year old male cow herder, weighing 45 kg and 130 cm tall was caught by the leg by a 4.5 m African rock python. The boy had been chasing cows through tall grass in the evening. He died of suffocation and internal injuries within the 20 minutes it took a search party to arrive and drive off the snake.

We should continue to treat the newspaper stories with a measure of scepticism, but it is well substantiated that occasionally very big boids can and do include humans as prey.

References:

- 1) Branch, W.R, A fatal attack on a young boy by an African rock python (Python sebae), J. of Herp., 14(3), pp.305-307, 1980
- 2) Anon., "In the hills of Tinombala stay well clear of snakes", Asiaweek, Sept.28, 1979.

R.W.

The Crocodile

Tyler's Natural History, printed in Britain by William Milner Halifax
Ca.1900 pp.431-435.

Of the Amphibious animals the crocodile is by far the most formidable; none, perhaps, in either element is there a creature, whose size, looks, power and ferocity inspire so general and well-founded terror. The whale, the shark, the sword-fish may be terrible in the waters, the elephant, lion and tiger may awaken fear and dread upon the land, but the crocodile carries terror and death in his yawning jaws, whether pursuing his prey through the foaming waters, or hunting it upon the dry land. Even when lying down in quiet, with all its vastness stretched along the strand, its naked teeth, glaring, fiery eyes, and malignant aspect, inspire unwonted terror; so that, as the scriptures state, "none is so fierce that dare stir him up". The crocodile is so completely assured and covered with its scaly folds, that so effectually and entirely invert it, especially on the upper parts of the body, that in the full grown animal, musket balls would be as powerless as stones hurled at the monster, and these as ineffectual as stubble".

The Crocodile Project in Andhra Pradesh

In late April my colleague J Vijaya and I were fortunate in being able to accompany Binod Choudhury and K Varaprasad of the Andhra Pradesh Crocodile Project on a one week tour of their mugger sanctuaries. Even discounting the trials and tribulations of achieving progress in the field here the developments in Andhra over this five year span have been spectacular. One of the main criteria for the success of a wildlife project in a developing country is the popularity of the programme at the local level and the Andhra project has obviously drawn sympathy and cooperation from villagers. Potentially explosive issues such as illegal fishing and channelling water for irrigation are approached firmly but diplomatically and this seems to have paid off. Protection is however strictly enforced and recently at Manjira, two fishermen were sentenced to 2 months imprisonment for netting crocodiles.

Below are some quick notes on crocodile sanctuaries visited. We are both extremely grateful to the FAO and the govt. personnel for their hospitality and help. Staff at the Crocodile Breeding and Management Training Institute in Hyderabad patiently allowed us to turn the place upside down trying to photograph Hemidactylus giganteus. And Binod Choudhury was very efficient about finding our dropped, lost and misplaced lens caps, binoculars, note books and pens. Special thanks to Dr. H R Bustard and Pushp Kumar for allowing us to join the trip.

Manjira River Sanctuary

Situated some 65 kms northwest of Hyderabad. The sanctuary comprises 32 kms of river. There have been no releases and no nest collection here. From surveys conducted in '77 and '79 there seem to be 15 adults. Last year Binod Choudhury saw 15 three month old hatchlings in a Typha clump. A cow was killed by a mugger a few days prior to our visit. We travelled about a third of the sanctuary's river distance, from Singoor to Pulkal, in the projects motor boat. Nesting areas are open banks, sparsely shaded with Acacia and the thick Ipomea provides ideal cover for hatchlings. Land on both sides of the river will eventually be added to the Sanctuary.

Lajamadugu Sanctuary

4 Kms of Godavari River 230 km due north of Hyderabad. Spectacular habitat with grass banks for nesting and Typha grasses providing hatchling cover. Two guards from a nearby village patrol the sanctuary and locate nests. Egg collection details - one nest in 1977 and 1978, 2 in 1979, 3 in 1980. This (1981) season 2 nests have been taken so far. (Incubation hatching and rearing in Hyderabad at the crocodile complex in Nehru Zoological Park). Saw 4 adults during night spotting. Crossed the river in Bombax dugouts and saw 2 nest holes; difficult to locate in thick vegetation 2 feet above waterline.

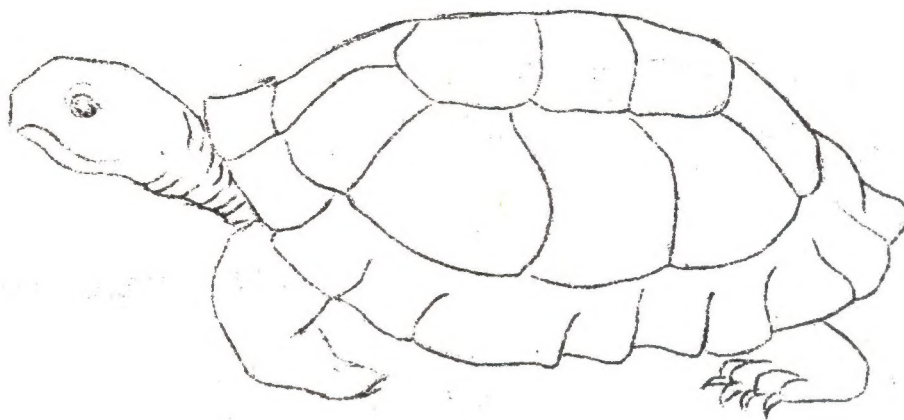
Pakhal Wildlife Sanctuary

An already established sanctuary into which crocodile project has calmly infiltrated. 15 mugger were released here of which we saw one during night spotting. The lake abounds in birdlife. We saw groups of spotbill ducks, white-eyed pochards, white ibis, open bill storks, etc.

Kinnerasani Sanctuary

33 mugger have been released into the Kinnerasani River, a tributary of Godavari. This was also an established reserve. The sanctuaries designated specifically for mugger by the project are Nagarjunasagar Srisailem, Manjira, Lajamadugu, Coringa (porosus) and Papikonda (where gharial may be released).

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DRAWING BY DORIS NORDEN

Breeding the African Dwarf Crocodile (*Osteolaemus tetraspis*) at Zoo Negara, Kuala Lumpur, with an observation on galloping.

The African Dwarf crocodile, a stumpy, more than usually pre-historic looking crocodilian has bred in captivity at six institutions. A complete summary of captive breeding is given by Tryon (1980).

The first record for Zoo Negara was reported in Hamalryad by Singh. On a recent visit to Zoo Negara (National Zoo) Mr. P.N. Phillips, Superintendent and Mr. Zainal Tahir, Asst. Superintendent kindly gave us the breeding data for the past 4 years which are given in Table 1.

In October 1975 two male and one female adult dwarf crocodiles were received from Switzerland. Subsequently one male died (dominance fight). The remaining pair (male 1.4 m, female 1.2 m) resides in a thickly vegetated enclosure 10 m x 5 m with a $1\frac{1}{2}$ m x $2\frac{1}{2}$ m pond, 30 cm deep. Egg laying has ranged over the three month period of April, May and June while hatching has been in June, July and August, corresponding to the lighter of the two monsoon season in West Malaysia, the southwest. The nest mound is of betetation (mainly grasses in this case), about 50 cm in diameter and 25 cm high. During our visit in January, 1981 there were no remains of the nest but a distinct wallow with a mean diameter of 55 cm and 10-15 cm deep. The female was seen coming from the water and crawling over the nest, wetting the nest surface, which if by design, would have little effect on temperature or humidity of the egg chamber.

Both male and female were very defensive of the nest but less so of the hatchlings. The young were removed soon after hatching and placed in a separate enclosure. While we were handling and photographing the juveniles a 2 year old, 75 cm animal escaped using the classic "gallop" as described by Cott (1961). Galloping has been observed in many crocodilians including gharial (Bustard and Singh, 1979) and is especially characteristic of the New Guinea crocodile (*C.novaeaguineae*).

Table 1: Breeding record of *Osteolaemus tetraspis* at Zoo Negara, Kuala Lumpur

<u>Date</u>	<u>Number hatched</u>	<u>Number died</u>
26/8/76	5	-
10/9/76	-	1
8/5/77	-	1
9/5/78	-	1
2/7/78	6	-
3/7/78	-	1
31/7/79	-	1
8/6/79	12	-
3/7/80	8	-
3/11/80	-	1 (missing)
3/12/80	six sent to London Zoo	

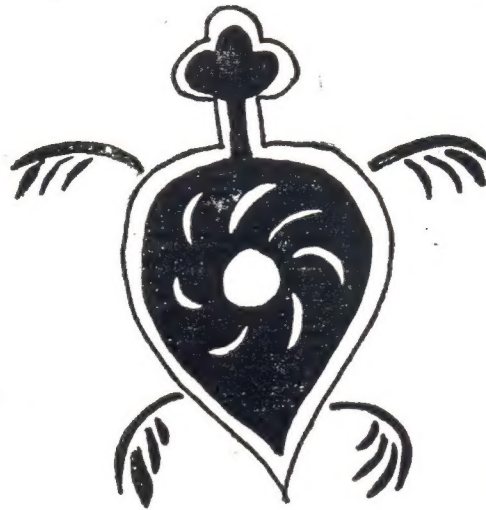
Total juveniles at Zoo = 19

- References: 1) Tryon, Bern W, "Observations on reproduction in the West African dwarf crocodile", in Reproductive Biology and Diseases of Captive Reptiles, SEAR, 1980.
- 2) Cott, Hugh B., Ecology and status of the Nile crocodile (*Crocodylus niloticus*), Trans., Zoo Soc., London., 29, 1961.

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Cover drawings by Doris Norden

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